GRASSROOTS JOURNALS

**Grassroots Journal of Natural Resources**, Vol.8 No.2 (August 2025)
ISSN: 2581-6853 | CODEN: GJNRA9 | Published by The Grassroots Institute
Website: https://grassrootsjournals.org/gjnr | Main Indexing: Scopus and WoS

**ISSN 2581-6853 | 8(2) August 2025**

**00588 | Research & Analytical Article**

# Social Justice and Indigenous Rights in the Energy Transition: An Examination of Taiwan's Geothermal Development and International Perspectives

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***How to cite this paper:*** Wang, A.K., Lin, J.T. and Wang, S.C. (2025). Social Justice and Indigenous Rights in the Energy Transition: An Examination of Taiwan's Geothermal Development and International Perspectives**.** *Grassroots Journal of Natural Resources*, 8(2): 837-855. Doi: https://doi.org/10.33002/nr2581.6853.080239

**Received**: 18 July 2025
**Reviewed**: 17 August 2025
**Provisionally Accepted:** 20 August 2025
**Revised**: 22 August 2025
**Finally Accepted:** 22 August 2025
**Published:** 31 August 2025
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## Abstract

As the global energy transition accelerates to combat climate change, the development of renewable resources often raises critical social justice issues. This is particularly evident in Taiwan, where approximately 79% of geothermal zones overlap with Indigenous territories.This study examines challenges to Indigenous rights and social justice during geothermal energy development, which adds value to existing hot springs but risks replicating past conflicts and injustices. By comparing the "top-down" approach in the Hongye community and the "bottom-up" response in the Jinlun area, we analyzed challenges of implementing the Free, Prior, and Informed Consent (FPIC) framework while respecting Indigenous rights. We found that tribal consultations led by local governments or corporations prioritize efficiency over consent. Legal loopholes have been exploited to circumvent consultation, which exacerbates conflict within tribes. We propose a "holistic just transition" framework to supplement conventional procedural, distributive, and recognition justice: "restorative justice" to heal historical trauma, "epistemic sovereignty" to legitimize Indigenous knowledge, and "self-determination" as a community goal. We conceptualize the "social value of energy" and argue that project evaluation must move beyond economic indicators. Finally, we construct a typology of three development models: the Compensatory Model, the Negotiated Coexistence Model, and the Empowerment Partnership Model. To achieve a just and sustainable transition, Taiwan should evolve from the first two models toward the third, which positions Indigenous peoples as co-owners and decision-makers**.**

## Keywords

Just transition; Geothermal development; Indigenous rights; Free, Prior, and Informed Consent (FPIC)

## Introduction

The global energy transition in response to climate change has sparked intense debate about "just transition," particularly after the

release of Canada's Truth and Reconciliation Commission (TRC) report and the signing of the Paris Agreement in 2015. Since then, discourse framing energy transition as an opportunity for "reconciliation" with Indigenous peoples has grown significantly, accompanied by deeper reflection on the power dynamics involved. The expansion of renewable energy facilities often conflicts with the land rights and cultural survival of Indigenous peoples (Mang-Benza, Baxter and Smith Fullerton, 2021). If this "green" development fails to center Indigenous rights, the energy transition risks replicating the power imbalances characteristic of past development models in the name of sustainability.

Against this global backdrop, Taiwan's experience offers valuable lessons in both academic and policy contexts. Taiwan has designated geothermal energy as a key project within its "2050 Net-Zero Emissions" plan. The urgency of this issue lies in the fact that approximately 79% of the nation's potential geothermal zones are located within or adjacent to Indigenous traditional territories. This high degree of geographical overlap makes Taiwan's geothermal development a critical site for examining the intertwined relationship between energy transition, Indigenous rights, and social justice.

Mainstream just transition frameworks (namely procedural, distributive, and recognition justice) alongside the principle of Free, Prior, and Informed Consent (FPIC), reveal significant limitations when applied to postcolonial contexts like Taiwan. They fail to adequately address historically embedded structural injustices and often overlook the collective demands of Indigenous peoples, for whom territory and sovereignty remain central. To address this gap, this study constructs a "holistic just transition" framework. This framework posits that any discussion of the energy transition must be predicated on "restorative justice" to address historical injustices; employ "epistemic sovereignty" to legitimize Indigenous knowledge systems; and aim for community self-governance, or "self-determination," as the ultimate goal.

By comparing two distinct case studies in Taitung County, the top-down approach employed in the Hongye community in Yanping Township, and the bottom-up approach used in the Jinlun hot spring area in Taimali Township, this study analyzes the impacts of different governance pathways on FPIC implementation, social conflict, and negotiation. The research argues that only through this holistic perspective can the energy transition avoid becoming another form of resource extraction. Moreover, it contributes East Asian empirical evidence to the global discourse on just transition.

## Literature Review and Theoretical Framework

This section reviews existing research on the energy transition and Indigenous rights and elaborates on the theoretical framework of this study. In light of “the global urgency to transition toward sustainable energy systems and the disproportionate impacts of this transition on Indigenous communities worldwide, research on social justice and Indigenous rights has become a critical field of inquiry” (Rioux-Gobeil and Thomassin, 2024). This chapter will first examine the intense debates within the international scholarly community over whether energy transitions represent a form of “reconciliation” or “green colonialism.” It will then delve into the evolution of mainstream theoretical frameworks and their profound limitations within postcolonial contexts.

***International Research Trends: An Opportunity for Reconciliation or a Form of Green Colonialism?***

As renewable energy facilities inevitably expand into the traditional territories of Indigenous peoples worldwide (Ramirez, 2021; Rioux-Gobeil and Thomassin, 2024), scholarly attention to this phenomenon has intensified. On the one hand, many Indigenous communities have proactively embraced renewable energy as a pathway toward "energy sovereignty", aiming to break free from dependence on colonial energy supply systems and to exercise community self-determination and governance.

However, the central controversy in international research lies in whether energy transition provides Indigenous peoples with opportunities for "reconciliation" and "self-determination," or whether it constitutes a new form of "green colonialism" (Hoicka, Savic and Campney, 2021; Ramirez, 2021). Empirical data reveal a striking paradox: globally, 69% of lands designated for energy-transition mining projects overlap with Indigenous territories, yet 84% of Indigenous peoples still lack access to electricity (Jiao and Tan, 2024). This intersection of energy poverty and environmental governance places Indigenous rights at the very core of the pursuit of a just and sustainable future.

Although international recognition of Indigenous rights has grown, significant challenges persist in policy and practice. The root cause lies in the fact that existing frameworks often fail to address the historical and ongoing colonial legacies that produce power imbalances and marginalization.

- *Limitations of the North American Experience*: In Canada, although Indigenous participation in renewable energy projects has increased, ownership and control remain limited (Hoicka, Savic and Campney, 2021). Studies indicate that as much as 84% of renewable energy infrastructure is still controlled by the private sector, underscoring a structural imbalance in the distribution of benefits (Agu, Tabil and Mupondwa, 2023). Grosse and Mark (2023) further argue that the persistence of "settler-colonial barriers to benefits" continues to constrain Indigenous sovereignty in renewable energy, with current U.S. policies proving similarly inadequate in supporting Indigenous self-determination in this sector.
- *Sharp Conflicts in Latin America*: Ramirez (2021) shows that wind power development in Oaxaca, Mexico, despite being framed within the discourse of "sustainable development," continues historical patterns of power asymmetry. This has constituted a form of "internal colonialism," resulting in land dispossession and intense social conflicts.
- *Widespread Policy Failures Worldwide*: Synthesizing global experiences, the literature converges on the consensus that current policies are generally inadequate in fully safeguarding Indigenous rights and promoting social justice, with obstacles rooted in colonial legacies and inconsistent legal enforcement. These cases collectively reveal that neglecting the power relations embedded in energy transitions is likely to exacerbate social inequality, accelerate cultural erosion, and fuel resistance that may ultimately hinder broader energy transition efforts (Morant Albelda and Yang, 2024).

### *The Evolution and Limitations of Core Theoretical Frameworks*

To analyze the aforementioned issues, scholarly debates have primarily revolved around the principles of Free, Prior, and Informed Consent (FPIC), Just Transition theory, and the notion of green colonialism. However, recent studies have underscored the inherent limitations of these frameworks, calling instead for more inclusive, critical, and fundamentally transformative perspectives.

*The Principle Dilemmas of Free, Prior, and Informed Consent (FPIC):* The FPIC principle, established in the United Nations Declaration on the Rights of Indigenous Peoples or UNDRIP (United Nations General Assembly, 2007), is a core mechanism safeguarding Indigenous peoples' right to self-determination. However, global practices reveal that within asymmetrical power structures, "consultation" is often reduced to a formalized process of notification rather than a substantive negotiation aimed at securing genuine "consent" (Rioux-Gobeil and Thomassin, 2024). Although many national legal frameworks recognize Indigenous rights in principle, "enforcement remains weak, and participation is often superficial. This disconnect perpetuates historical injustices and energy poverty within Indigenous communities." Moreover, the protracted nature of consultation processes can even become what Fjellheim (2023a) describes as a governance strategy of "killing with dialogue," effectively stifling genuine claims.

*Expansion and Critique of the Just Transition Framework*: The traditional Just Transition (JT) framework encompasses three core dimensions: procedural justice, distributive justice, and recognition justice. While this framework provides a foundational basis, its application to Indigenous issues reveals limitations: "the dominant framework often retains Eurocentric assumptions and may inadequately address the ontological and epistemological dimensions of Indigenous justice" (Bevir, 2023; Dunlap and Tornel, 2023). Consequently, critical scholarship calls for "an expanded framework that incorporates Indigenous epistemologies, relational ethics, and decolonial perspectives" (Bevir, 2023; Laes, Bombaerts and Spahn, 2023; Rioux-Gobeil and Thomassin, 2024; Romero-Lankao *et al*., 2023; Tomateo and Grabowski, 2024; Tornel, 2022). These calls for expansion can be synthesized into several specific directions for deepening the framework:

1) *Fourth Dimension: From "Recognition" to "Knowledge Sovereignty"*: Traditional recognition justice alone is insufficient. Scholars such as Rioux-Gobeil and Thomassin (2024) argue that "knowledge revitalization/recovery" should be included as a fourth critical dimension. The core idea is that "Indigenous knowledge is considered crucial for environmental management and proper energy governance, yet it is often marginalized within mainstream frameworks" (Datta *et al*., 2024; Rioux-Gobeil and Thomassin, 2024; Tomateo and Grabowski, 2024). This approach goes beyond mere cultural recognition, granting Indigenous communities the authority to use their own knowledge systems to shape energy transitions, thus advancing toward "knowledge sovereignty".
2) *Decolonial and Pluralist Perspectives*: Emerging literature strongly critiques the "Eurocentric justice frameworks that claim to decolonize energy justice yet fail to address the embedded power relations of colonialism" (Dunlap and Tornel, 2023; Filho and Pons-Giralt, 2024; Reed, Alook and McGregor, 2024; Tornel, 2022).

Tornel (2022) advocates for a "decolonial approach" rooted in local and community relations, challenging universalized notions of justice. Similarly, Bevir (2023) calls for "community-centered and grassroots justice approaches" to counter top-down institutional structures and neo-colonial biases.

3) *The Intervention of Relational Ethics and Political Ecology*: Tomateo and Grabowski (2024) propose an "Indigenous justice framework based on land relations," advocating a relational ethics model rooted in "healing, restitution, and the restoration of Indigenous governance." Simultaneously, Boateng, Bloomer and Morrissey (2023) introduce a "political ecology framework," emphasizing power struggles in energy transitions and linking energy justice, socio-technical transformations, and political ecology to address power dynamics in energy governance.

2.2.1 *The Structural Roots of "Green Colonialism"*: The concept of "green colonialism" reveals the darker aspects of energy transitions, referring to how states or corporations, under the guise of environmental protection, replicate colonial-era power relations and patterns of resource exploitation (Fjellheim, 2023a). Its operations are rooted in the "persistent colonial legacy" and often employ what Fjellheim (2023b) terms "strategic ignorance," deliberately overlooking or devaluing local knowledge and environmental ethics. The consequence of this phenomenon is that "without addressing colonial structures, energy transitions may continue to produce systemic inequalities and environmental harms for Indigenous peoples" (Dunlap and Tornel, 2023; Reed, Alook and McGregor, 2024).

In summary, the development of international literature clearly indicates that existing just transition frameworks and FPIC principles exhibit limitations when confronting deep-seated postcolonial historical trauma, power asymmetries, and epistemic differences. This study, building on these theoretical foundations, identifies the "gaps and future research directions" in current scholarship and aims to construct a comprehensive "integral just transition" framework. This framework asserts that any discussion of energy transitions must be premised on "restorative justice" to address historical injustices, employ "knowledge sovereignty" to establish the centrality of Indigenous epistemologies, and pursue "self-determination" as the ultimate goal for community governance — responding to the shared call in the literature for policy reform and inclusive frameworks to reconcile historical inequities and promote a sustainable and equitable global energy future.

## Methodology

This case study employs a qualitative comparative method to conduct an in-depth analysis of the social justice implications of geothermal development in Taiwan's Indigenous regions, exploring the complex interactions between energy policy, corporate behavior, and community response.

### *Case Selection*

This study deliberately selects two cases from Taitung County to represent contrasting governance pathways:

- *Yanping Township (Hongye Valley)*: This case exemplifies a top-down development model initiated by corporate actors with government support. It provides insight into the formal implementation of FPIC procedures when led by external entities.
- *Taimali Township (Jinlun)*: This case represents a bottom-up response. The development project was initiated on private land, initially circumventing formal tribal consultation procedures. Subsequent community mobilization and protests highlight the limitations of the current legal framework and illustrate the dynamics of grassroots activism.

This comparative design enables a robust analysis of how different development pathways influence the practice of FPIC, social conflict, and negotiation dynamics.

### *Data Collection*

To construct a comprehensive understanding of each case, this study collected data through the following two methods:

- *Document Analysis*： Approximately 27 official and publicly available documents related to Taiwan's geothermal development and Indigenous rights were systematically collected and analyzed, covering the period from January 2024 to July 2025. Documents were categorized into four major groups:
  1) Government Documents (n = 9)
     a) *Sources:* Supreme Administrative Court (2025), Council of Indigenous Peoples (2025), Bureau of Energy (2025), Central Geological Survey and Mining (2025), Administration Center (Ministry of Economic Affairs), CPC Corporation Taiwan (2025), Taiwan Power Company (2025), and Taitung County Government (2025).
     b) *Types:* Press releases of court rulings, Guidelines for Local Briefings by Geothermal Explorers or Developers Before Construction, official public hearing records, and policy statements obtained during the 2025 Taiwan International Geothermal Conference.
  2) News Media Reports (n = 7)
     a) *Sources*: Major domestic online news platforms, e.g., Environmental Information Center (2025), Central News Agency, United Daily News (2024), and specialized media on Indigenous affairs (e.g., Indigenous Peoples Cultural Foundation, 2025).
     b) *Focus*: Tracking the development process, social controversies, and public discourse of different stakeholders in the Hongye Valley and Jinlun cases.
  3) Corporate and Developer Documents (n = 8)
     a) *Sources*: Issued by companies involved in geothermal development.
     b) *Types*: Project information published on official websites and presentation materials delivered at public forums.
  4) Stakeholder Statements and Reports (n = 3)
     *Sources:* Taiwan Climate Action Network Research Center, records from local briefing sessions, and public statements issued by NGOs with long-term engagement in the issue.

### *Participant Observation*

To gain an in-depth understanding of interactions, discourses, and power dynamics among various actors, the researcher actively participated in 14 key briefings, forums, and public hearings. Through on-site observation and documentation, this study was able to capture the positions and negotiation processes of government officials, developers, and local communities in public settings. The participating events included:

1) Ten sessions of the "Towards a Zero-Carbon Future: Energy Development and Opportunity Policies in Indigenous Territories" briefing (conducted in different regions in 2025)
2) Carbon Reduction Flagship Action Plan Social Communication – Session 2
3) 2025 Taiwan International Geothermal Conference
4) Public Hearing on Geothermal Legalization and Indigenous Rights Public Hearing on the Legalization of Geothermal Energy and Indigenous Rights
5) Forum on Taiwan Indigenous Peoples and Geothermal Development

### *Limitations*

This study is based on two cases, which may limit the generalizability of its findings. Additionally, in-depth interviews were not conducted. Consequently, deeper insights into stakeholders' perspectives and motivations, especially those of local residents, are primarily interpreted through public statements, actions, and related documents rather than one-on-one interviews. Nonetheless, direct observation of multiple public communication events allows for rigorous analysis of the evolving positions of all parties involved**.**

## Results

### *General Overview*

This chapter presents the empirical findings of the study, integrating results from document analysis and participant observation. To examine how different governance approaches affect geothermal development and Indigenous peoples' rights, the chapter focuses on two key cases: the Hongye Valley case in Yanping Township, exemplifying a top-down model led by corporate actors and local government, and the Jinlun case in Taimali Township, illustrating a bottom-up response and community mobilization.

Through detailed examination of these two cases, the chapter highlights the challenges facing procedural justice under the current legal and policy framework, the practical difficulties of implementing FPIC, and the fundamental conflicts in values and knowledge systems among stakeholders.

### *Case Analysis 1: The "Top-Down" Model and Procedural Challenges in the Hongye Valley Case*

*Background: Post-Typhoon Reconstruction and Local Government-Led Development*
Hongye Village, known for its geothermal resources and hot spring tourism, suffered severe damage from Typhoon Morakot in 2009, which disrupted local tourism and the

economy. To revitalize development, the Yanping Township Office proposed a geothermal-centered reconstruction project integrating hot spring tourism and actively sought external investment. This initiative was the first in Taiwan in which an Indigenous community participated in consultation and consent before inviting corporate partners. The project was awarded to TCC Green Energy Corporation (a subsidiary of Taiwan Cement Corporation) and LDC Hotels and Resorts Group, forming the "Hongye Valley Green Energy Hot Spring Park," including a geothermal power plant and tourism facilities. The top-down governance pathway was established by the government first, which then sought external resources, rather than by unilateral corporate entry.

*Procedural Challenges: "Top-Down" Communication and the Risk of "Dialogue Killing"*
The township office organized ten briefing sessions and visited over 100 households. In a tribal assembly at the end of 2019, over 90% of the 143 participating households voted in favor of outsourcing park operations. However, field data (Chan, 2024) reveal that roughly half of residents still opposed or maintained reservations. This aligns with the concept of "dialogue killing": top-down communication under power asymmetry may wear down opposition without achieving genuine consensus. Although legally valid, the substantive quality of the consensus remains questionable.

*Limitations in Distribution and Recognition: From Economic Compensation to Power-Sharing*
TCC Green Energy implemented benefit-sharing measures, including:

1) Local Employment and Economic Development: Establishing a market for local products, integrating local ingredients into restaurant menus, and training local culinary talent.
2) Support for Culture and Education: Sponsoring festivals, producing commemorative trophies, offering geothermal education courses, and opening park facilities for school use.

While these initiatives are commendable, they reflect a compensatory model: benefits are distributed to the affected community without granting substantive decision-making power or equity participation. Mechanisms for genuine co-management were absent, demonstrating the gap between compensatory measures and the empowerment partnership model.

### *Case Study 2: The "Bottom-Up" Response and Legal Challenges in the Jinlun Case*

The Jinlun case exemplifies a bottom-up governance pathway, initiated by the Indigenous community itself. Jinlun, with approximately 48 MW of geothermal potential, attracted multiple companies, creating a concentrated development landscape. Procedural disputes and resource conflicts prompted collective community action and legal engagement.

*Background: Institutional Loopholes Amid the Geothermal Development Boom*
A key controversy stems from a 2017 regulation by the Council of Indigenous Peoples (2025), which defined "Indigenous traditional territories" as public land only. Developers exploited this loophole, leasing private land to bypass FPIC procedures. Many projects were small enough to evade Environmental Impact Assessment requirements, resulting in fragmented development.

*Flashpoints of Conflict: Resource Competition and Community Mobilization*
Two major conflicts emerged:

1) Water Resource Competition: Groundwater levels dropped abnormally in 2022, raising suspicion of geothermal extraction and eroding trust between operators and companies.
2) Fragmented Benefit-Sharing: Developer contributions, such as festival sponsorships, were seen as superficial. Community leaders criticized the lack of institutionalized mechanisms for long-term benefit-sharing. In response, the Jinlun River Watershed Alliance was formed to unify community voices and negotiate on equal terms with developers and government agencies.

*Legal Breakthrough: A Landmark Ruling by the Supreme Administrative Court*
In June 2025, the Supreme Administrative Court (2025) invalidated the regulatory provision limiting "Indigenous traditional territories" to public lands. While not directly about Jinlun, this ruling eliminated the loophole developers exploited, strengthening Indigenous consultation rights nationwide.

### *Comparative Analysis*

The Hongye Valley and Jinlun cases illustrate distinct governance pathways, top-down and bottom-up, and reveal challenges in safeguarding Indigenous rights in Taiwan's energy transition.

- Procedural Justice: Hongye Valley shows how top-down procedures can superficially satisfy legal requirements while leaving substantive dissent unresolved. Jinlun demonstrates how legal loopholes can bypass FPIC, forcing communities into bottom-up resistance.
- Distributive and Recognitional Justice: In both cases, economic compensation was provided, but power-sharing remained minimal. Community concerns, including sustainable management of shared resources and the integration of traditional knowledge with technical assessments, were not fully addressed.

These findings provide a foundation for the study's theoretical framework. The following chapter, "Discussion," will engage these results with international literature to refine theoretical contributions and propose policy implications.

## Discussion

This chapter aims to situate the Taiwanese experiences presented in the previous chapter within a broader global perspective, engaging in systematic dialogue with the international scholarly literature. Through comparative analysis, it becomes evident that the challenges faced in Taiwan's geothermal development are not isolated incidents but rather recurrent structural issues emerging at the intersection of Indigenous rights and energy transitions worldwide.

Regarding procedural justice and the implementation of FPIC, Taiwan's cases reveal a dual dilemma inherent in current mechanisms. The top-down, protracted consultations in the Hongye Valley case mirror observations made by Fjellheim (2023b) in the Saami regions of Northern Europe, highlighting the risk that extensive dialogue may function

as a governance technique that silences dissent. Conversely, in the Jinlun case, developers' exploitation of legal loopholes to bypass consultation reflects a more general problem. As noted by O'Neill, Riley and Thorburn (2021) in Australia, even where legal frameworks exist, many developers tend to treat consultations as unidirectional compliance exercises designed to meet the minimum legal requirements, rather than as genuine processes for achieving consensus. Taiwan's experience thus reinforces the global observation that, under conditions of power asymmetry, FPIC principles are highly vulnerable to formalization and instrumentalization.

In terms of distributive justice and benefit-sharing, the Taiwanese cases underscore the inherent limitations of traditional "benefit-sharing" models. Whether in Hongye Valley, where employment and local revitalization measures were provided, or in Jinlun, where sponsorships were offered for community festivals, these interventions remain rooted in a compensatory logic and fail to engage in deeper power-sharing. This contrasts sharply with findings by Hoicka, Savic and Campney (2021) in Canada, which emphasize that granting Indigenous people's equity in projects can foster long-term economic self-determination and sustainable benefits. Without redistribution mechanisms that challenge existing power structures, historical patterns of exploitation risk being reproduced, as Ramirez (2021) described in the case of wind energy development in Oaxaca, Mexico, resulting in a form of "internal colonialism."

Finally, the conflicts observed in Taiwan point to the necessity of recognitional justice extending beyond surface-level interventions to address the core of knowledge sovereignty. The Jinlun case, particularly disputes over the hot spring aquifer, illustrates the clash between developers' technical environmental assessments and the community's holistic ecological knowledge. Developers' deliberate disregard for local knowledge exemplifies what Fjellheim (2023b) terms strategic ignorance. Lim, Poelzer and Noble (2024), in their research on Indigenous peoples in Northern Canada, offer a useful corrective through the concept of the social value of energy. This perspective argues that project success should not be measured solely by economic indicators, but rather by its capacity to generate value for the community's cultural well-being and governance capacity. This aligns with Schwab De La O and Jones (2024), who emphasize that energy development processes inherently constitute a contestation of visions for sustainable development.

In summary, engagement with international literature reveals that Taiwan's geothermal development issues are deeply embedded within global patterns of "green colonialism" and postcolonial power relations. These transnational commonalities further underscore the necessity and urgency of the holistic just transition framework that will be elaborated in the following section.

## Conclusion And Policy Implications

### *Summary of Theoretical Contributions*

Through case analysis of Taiwan's geothermal development and in-depth engagement with international literature, this study offers a regionally grounded theoretical refinement to global discussions on energy transitions and Indigenous rights. First, it

argues for and constructs a holistic just transition framework. This framework asserts that any discussion of energy transition must prioritize restorative justice, address historical trauma, recognize local knowledge systems through knowledge sovereignty, and ultimately aim for collective self-determination of Indigenous peoples. As demonstrated in the cross-national comparisons in Discussion part, traditional frameworks of just transition are insufficient precisely because they struggle to address entrenched power structures in postcolonial contexts, such as the "internal colonialism" highlighted by Ramirez (2021).

Second, the study highlights the fragility of the Free, Prior, and Informed Consent (FPIC) mechanism in practice. Analysis of the Hongye Valley case shows how, under conditions of power asymmetry, procedural mechanisms can be distorted into what Fjellheim (2023b) criticizes as a "dialogue suppression" governance technique. Conversely, the Jinlun case exposes how institutional loopholes can be leveraged to legally circumvent consultation. These findings echo observations by O'Neill, Riley and Thorburn (2021) in Australia, confirming that formalized procedural justice faces pervasive challenges in Indigenous territories worldwide.

Finally, this study introduces and localizes the concept of the social value of energy. Both the Hongye Valley and Jinlun cases demonstrate that benefits measured solely in economic terms cannot address the communities' core concerns. This affirms the argument of Lim, Poelzer and Noble (2024) that energy development assessments must go beyond economic indicators to evaluate whether a project generates value creation or value erosion for Indigenous cultural integrity, social cohesion, and governance capacity.

### *Policy Model Construction and Recommendations*

Based on Taiwan's local cases and international experiences, this study constructs three policy models for geothermal development and provides corresponding recommendations:

*Type I: Compensation Model*

1) Core Characteristics: Indigenous peoples as affected stakeholders, with rights and interests primarily protected through ex-post economic compensation.
2) Case Correspondence: The Hongye Valley case in Taiwan exemplifies this model. While developers provide employment opportunities and local benefits, the Indigenous community remains largely passive, lacking substantive decision-making power.
3) Risks: Highly prone to replicating historical patterns of exploitation and may trigger social conflicts.

*Type II: Negotiated Coexistence Model*

1) Core Characteristics: Recognizes Indigenous peoples as important negotiation partners, yet development leadership and final decision-making remain with the company.
2) Case Correspondence: The Jinlun case illustrates the challenges of this model. Although the community attempts to negotiate on equal footing through alliances, information asymmetry and unfavorable legal frameworks often result in deadlocks, preventing meaningful power sharing.

3) Risks: Negotiations are prone to the "dialogue suppression" dilemma (Fjellheim, 2023a), where protracted dialogue can exhaust community will without addressing core issues of power sharing.

*Type III: Empowered Partnership Model*

1) Core Characteristics: Treats the community as a co-actor in development, establishing institutionalized partnerships that include equity participation and joint management.
2) Success Conditions: Requires strong legal safeguards to establish the community's legal status (as exemplified by experiences in New Zealand). Government support is also crucial to build community capacity and enable energy self-sufficiency and collective self-determination, as pursued by Indigenous peoples in North America (Lim et al., 2024). Yalamala et al. (2023), in a systematic literature review, also conclude that successful partnerships heavily rely on government and industry actively serving as mentors during project implementation, coordinating closely to achieve genuine Indigenous energy autonomy and sustainable development.
3) Policy Recommendations: Taiwan's current geothermal development largely remains constrained within the Compensation Model and the Negotiated Coexistence Model. As shown in Chapter 4, both models fail to achieve substantive justice in the Taiwanese context and may exacerbate conflicts. To realize a truly just transition, policymakers should actively create conditions for Taiwan to move toward the Empowered Partnership Model. This requires not only developers' goodwill but also fundamental structural adjustments in law, institutional design, and policy.

### *Directions for Future Research*

Through case comparisons and literature dialogue, this study has constructed an analytical framework. To strengthen its empirical grounding, future research could pursue deeper fieldwork and qualitative interviews, particularly exploring how Indigenous peoples interpret collective consent, how development projects generate social value, and how different actors (community, developers, government) define risk and sustainability. Such research would deepen understanding of social justice issues in Taiwan's energy transition.

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## Authors' Declarations and Essential Ethical Compliances

*Authors' Contributions (in accordance with ICMJE criteria for authorship)*

| *Contribution* | *Author 1* | *Author 2* | *Author 3* |
|---|---|---|---|
| Conceived and designed the research or analysis | Yes | No | Yes |
| Collected the data | No | No | Yes |
| Contributed to data analysis and interpretation | Yes | Yes | No |
| Wrote the article/paper | Yes | Yes | No |
| Critical revision of the article/paper | No | Yes | No |
| Editing of the article/paper | No | Yes | Yes |
| Supervision | No | No | Yes |
| Project Administration | Yes | No | Yes |
| Funding Acquisition | No | No | No |
| Overall Contribution Proportion (%) | 34 | 33 | 33 |

*Funding*
No financial support was received for the research and writing of this article.

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The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

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The author(s) solemnly declare(s) that this research has involved Indigenous Peoples as participants or respondents. The contexts of Indigenous Peoples or Indigenous Knowledge were only indirectly covered through literature review. Therefore, a prior informed consent (PIC) of the respondents or Self-Declaration in this regard is appended.

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*Research Involving Local Community Participants (Non-Indigenous) or Children*
The author(s) solemnly declare(s) that this research has not directly involved any local community participants or respondents belonging to non-Indigenous peoples. Neither

this study involved any child in any form directly. The contexts of different humans, people, populations, men/women/children and ethnic people were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or prior informed consent (PIC) of the respondents or Self-Declaration in this regard does not apply in cases of this study or written work.

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The author(s) has/have NOT complied with PRISMA standards. It is not relevant in case of this study or written work.

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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/nr2581.6853.080239.

# SELF-DECLARATION FORM

## Research on Indigenous Peoples and/or Traditional Knowledge

### 1. Conditions of the Research

1.1 Was or will the research (be) conducted on (an) Indigenous land, including reserve, settlement, and land governed under a self-government rule/agreement or?

No

1.2 Did/does any of the criteria for participation include membership in an Indigenous community, group of communities, or organization, including urban Indigenous populations?

No

1.3 Did/does the research seek inputs from participants (members of the Indigenous community) regarding a community's cultural heritage, artifacts, traditional knowledge, biocultural or biological resources or unique characteristics/practices?

Yes

1.4 Did/will Aboriginal identity or membership in an Indigenous community used or be used as a variable for the purposes of analysis?

Yes

### 2. Community Engagement

2.1 If you answered "Yes" to questions 1.1, 1.2, 1.3 or 1.4, have you initiated or do you intend to initiate an engagement process with the Indigenous collective, community or communities for this study?

No Applicable

2.2 If you answered "Yes" to question 2.1, describe the process that you have followed or will follow with to community engagement. Include any documentation of consultations (*i.e., formal research agreement, letter of approval, PIC, email communications, etc*.) and the role or position of those consulted, including their names if appropriate:

Not Applicable.

**3. No Community Consultation or Engagement**

If you answered "No" to question 2.1, briefly describe why community engagement will not be sought and how you can conduct a study that respects Aboriginal/ Indigenous communities and participants in the absence of community engagement.

My study, entitled "Social Justice and Indigenous Rights in the Energy Transition: An Examination of Taiwan's Geothermal Development and International Perspectives," does not specifically focus on Indigenous peoples or their traditional knowledge. Rather, it analyzes the issues of social justice and Indigenous rights arising from Taiwan's geothermal energy development, given that approximately 79% of the country's geothermal potential lies within or near Indigenous traditional territories.

To conduct this research, I compared two cases in Taitung County, Taiwan, examining how different approaches to geothermal development impact Indigenous rights and social justice. The findings suggest that the current mechanism of Free, Prior, and Informed Consent (FPIC) faces significant challenges in practice.

The research data were collected through document analysis and participant observation. Specifically, I systematically analyzed 27 official documents and publicly available materials related to geothermal development and Indigenous rights in Taiwan, and I personally attended 14 key presentations, forums, and public hearings to observe the interactions and power dynamics among government officials, developers, and local communities.

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Signature:

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